

CLAIMS

I claim:

1. A flanged ball-and-socket nut assembly comprising:
a nut having a convex hemispherical surface having an internal threaded bore for receiving a threaded shaft;
an approximately hemispherical concave socket adapted to receive, mate with and retain the nut, the socket having a hole and slot through a portion thereof for receiving a portion of a threaded shaft engaged with the nut, wherein the slot and hole is smaller in size than the nut; and
a flange attached to a portion of the periphery of the socket, the flange having a notch through a portion thereof, wherein the notch is sufficiently large in size to permit passage of the nut into the socket.
2. The nut assembly of claim 1, wherein the nut further comprises tool engaging means adapted to receive a tool that can be used to drive or rotate the nut when engaged with a threaded shaft.
3. The nut assembly of claim 2, wherein the tool engaging means comprises a recess.
4. The nut assembly of any one of claims 1, 2 or 3, wherein the nut assembly comprises a material suitable for use in orthopedic surgery.
5. A split-nut assembly comprising:
two or more nut sections which form a nut when assembled, the nut having a threaded bore, a first annular groove having a first diameter, and a second annular groove having a second diameter, wherein the second diameter is larger than the first diameter and smaller than the widest diameter of the nut; and
a band disposed in either of the first and second grooves to keep the two or more nut sections in assembly;
wherein the nut sections are spaced from one another a first distance when the band is in the first groove and in closer proximity or in contact with one another when the band is in the second groove.
6. The split-nut assembly of claim 5, wherein the first groove is disposed adjacent a first end of

the nut.

7. The split-nut assembly of claim 6, wherein the second groove is disposed between the first groove and a second end of the nut.

8. The split-nut assembly of claim 5, wherein the band is an o-ring or a snap ring.

9. The split-nut assembly of claim 8, wherein a portion of the surface of the band mates with corresponding portions of the peripheral surface of the nut.

10. The split-nut assembly of claim 5, wherein the nut further comprises a shoulder interposed the first and second grooves.

11. The split-nut assembly of claim 10, wherein each groove further comprises a flange to keep the retainer in its respective groove.

12. The split-nut assembly of claim 5 comprising:

two nut sections which form a nut when assembled, the nut having a threaded bore, a first annular groove having a first diameter, a second annular groove having a second diameter, a shoulder interposed the first and second grooves, wherein the second diameter is larger than the first diameter and smaller than the widest diameter of the nut;

a snap ring disposed in either of the first and second grooves to keep the two or more nut sections in assembly;

wherein,

the nut sections are spaced from one another a first distance when the band is in the first groove and in closer proximity or in contact with one another when the band is in the second groove; and a portion of the surface of the snap ring mates with corresponding portions of the peripheral surface of the nut.

13. A pivot wing bolt tissue-tensioning assembly comprising:

a threaded shaft having a head comprising a swing stop and a wing mount;

a single wing having an aperture engaged with the wing mount such that the wing is rotatably mounted on the wing mount;

wherein:

the linear axis of the wing is alignable with the linear axis of the threaded shaft; and

the swing stop limits the rotation of the wing about the wing mount to less than one revolution.

14. The assembly of claim 13, wherein the aperture in the wing is recessed.

15. The assembly of claim 13, wherein the swing stop limits the rotation of the wing about the mount to about 90 degrees of revolution or less.
16. The assembly of claim 13, wherein the threaded shaft has a longitudinal bore there through.
17. The assembly of claim 16, wherein the longitudinal bore has two or more openings.
18. The assembly of claim 17, wherein at least one of the openings are disposed at or adjacent the head of the threaded shaft.
19. The assembly of claim 13, wherein the wing mount comprises a hub and an axle.
20. The assembly of claim 13, wherein the wing is flat and its width approximates or is less than the width of the head of the threaded shaft.
21. The assembly of claim 13 further comprising:

an installation tool that controls deployment of the wing from a first position parallel to the linear axis of the threaded shaft to a second position not parallel to the linear axis of the threaded shaft.
22. The assembly of claim 21, wherein the tool has a first end that mates with at least one end of the wing.
23. The assembly of claim 21, wherein the threaded shaft passes through the tool.
24. The assembly of claim 21, wherein the tool is a sleeve having a first end that mates with at least one end of the wing.
25. The assembly of claim 21, wherein the tool is rotated about and pushed along the linear axis of the threaded shaft to deploy the wing from a first position to a second position.
26. The assembly of claim 13 further comprising a nut assembly engaged with the threaded shaft.
27. The assembly of claim 26, wherein the nut assembly is selected from the group consisting of a conventional nut, a split-nut assembly, and a ball-and-socket nut assembly.

28. The assembly of claim 27, wherein the split-nut assembly comprises:

two or more nut sections which form a nut when assembled, the nut having a threaded bore, a first annular groove having a first diameter, and a second annular groove having a second diameter, wherein the second diameter is larger than the first diameter and smaller than the widest diameter of the nut; and

a band disposed in either of the first and second grooves to keep the two or more nut sections in assembly;

wherein the nut sections are spaced from one another a first distance when the band is in the first groove and in closer proximity or in contact with one another when the band is in the second groove; and optionally wherein the sections of the split-nut are detached from one another or attached to each other by way of a living hinge.

29. The assembly of claim 27, wherein the ball-and-socket nut assembly comprises:

an approximately hemispherical convex nut having an internal threaded bore for receiving a threaded shaft;

an approximately hemispherical concave socket adapted to receive, mate with and retain the nut, the socket having a slot and hole through a portion thereof for receiving a portion of a threaded shaft engaged with the nut, wherein the slot and hole is smaller in size than the nut; and

a flange attached to a portion of the periphery of the socket, the flange having a notch through a portion thereof, wherein the notch is sufficiently large in size to permit passage of the nut into the socket.

30. The assembly of claim 13, wherein at least the wing comprises a material that deteriorates in an environment of use.

31. The assembly of claim 30, wherein the wing comprises one or more dissolvable polymers.

32. The assembly of claim 30, wherein the wing, the threaded shaft and the nut assembly are comprised of a material that deteriorates in an environment of use.

33. The assembly of claim 13, wherein the threaded shaft comprises buttress threads.

34. The assembly of claim 26, wherein each of the threaded shaft and the nut assembly comprises buttress threads

35. The assembly of claim 34, wherein the buttress threads have a long slope on one surface and a short slope on another surface such that the nut sections expand in and out as the nut is moved linearly forward on the threaded shaft.

36. A tissue-tensioning bolt assembly comprising:

a first threaded shaft having a tissue retainer at a first end; and

a first flanged ball-and-socket nut assembly according to any one of claims 1-4.

37. The tissue-tensioning bolt assembly of claim 36 further comprising:

a second threaded shaft having a second tissue retainer at a second end; and

a second flanged ball-and-socket nut assembly.

38. The tissue-tensioning bolt assembly of claim 37 further comprising a tissue graft attached to each of the first and second tissue retainers.

39. The tissue-tensioning bolt assembly of claim 36, wherein the tissue retainer is an eyelet or hole.

40. A transverse impaction screw comprising:

a tool engagement means;

a threaded portion adjacent the tool engagement means; and

a non-threaded extended member attached to the threaded portion and comprising a flat surface.

41. The screw of claim 40, wherein the plane defining the flat surface is not parallel to the linear axis of the screw.

42. A suture nut comprising:

two or more nut sections which form a nut when assembled, the nut comprising a non-threaded bore with a friction surface, a first annular groove having a first diameter, and a second annular groove having a second diameter, wherein the second diameter is larger than the first diameter and smaller than the widest diameter of the nut; and

a band disposed in either of the first and second grooves to keep the two or more nut sections in assembly;

wherein the nut sections are spaced from one another a first distance when the band is in the first groove and in closer proximity or in contact with one another when the band is in the second groove; and

the suture nut is capable of securing a suture when the band is disposed in the second groove.

43. The suture nut of claim 42 further comprising a second non-threaded bore having a friction surface such that the suture nut can retain at least two suture portions.

44. The suture nut of claim 42, wherein the bore is non-circular and the suture nut will retain at least two suture portions in the same bore.

45. A method of suturing an incision comprising the step of:

clamping one or more portions of a suture with a suture nut according to any one of claims 42-44.

46. A method of tensioning a biological tissue comprising the step of retaining and tensioning a biological tissue with a tissue-tensioning bolt assembly according to claim 36.

47. A method of tensioning a biological tissue comprising the step of retaining and tensioning a biological tissue with a tissue-tensioning bolt assembly according to claim 37.

48. A method of tensioning a biological tissue comprising the step of retaining and tensioning a biological tissue with a tissue-tensioning bolt assembly according to claim 38.

49. A method of tensioning a biological tissue comprising the step of retaining and tensioning a biological tissue with a pivot wing bolt tissue-tensioning assembly according to any one of claims 13-35.

50. A flanged ball-and-socket nut assembly comprising:
a longitudinally split-nut having a convex hemispherical surface having an internal threaded bore for receiving a threaded shaft;
an approximately hemispherical elongated concave socket adapted to receive, mate with and retain the nut, the socket having a hole and slot through a portion thereof for receiving a portion of a threaded shaft engaged with the nut, wherein the slot and hole is smaller in size than the nut, and wherein the socket has a first larger inner diameter section and a second smaller diameter inner section; and
a flange attached to the first larger diameter portion at the periphery of the socket, the flange having a notch through a portion thereof, wherein the notch is sufficiently large in size to permit passage of the nut into the socket; wherein
the socket is adapted to compress the split-nut when the split-nut is engaged with the second smaller diameter inner section of the socket.
51. The flanged ball-and-socket nut assembly of claim 50, wherein the sections of the split-nut are longitudinally slidably engaged with each other.
52. The flanged ball-and-socket nut assembly of claim 50, wherein the split-nut comprises tool engaging means.
53. The flanged ball-and-socket nut assembly of claim 50 further comprising a sleeve interposed the socket and the split-nut.
54. The flanged ball-and-socket nut assembly of claim 53, wherein an outer portion of the sleeve engages the interior of the socket and the split-nut is disposed within a bore in the sleeve.
55. The flanged ball-and-socket nut assembly of claim 50, wherein the socket is a compression tower.
56. A pivot wing bolt tissue-tensioning assembly comprising:
a threaded shaft having a head comprising a wing mount;
a single wing having an aperture engaged with the wing mount such that the wing is rotatably mounted on the wing mount; and
a swing stop that limits the rotation of the wing from a first position approximating parallel to the linear axis of the threaded shaft to a second position approximating normal to the linear axis of the threaded shaft;

the linear axis of the wing is alignable with the linear axis of the threaded shaft; and

the swing stop limits the rotation of the wing about the wing mount to less than one revolution.

58. The pivot wing bolt tissue-tensioning assembly of claim 56, wherein the swing stop is integral with the head of the threaded shaft.

two or more nut sections which form a nut when assembled, the nut having a threaded bore; and
section retaining means selected from the group consisting of a band, a socket, and a combination
thereof;

60. The split-nut assembly of claim 59, wherein the nut comprises a first annular groove having a first diameter, and a second annular groove having a second diameter, wherein the second diameter is larger than the first diameter and smaller than the widest diameter of the nut, and the section retaining means is engageable with the annular grooves of the nut.

62. The split-nut assembly of claim 59, wherein the section retaining means is a socket having a first larger diameter inner portion, and a second smaller diameter inner portion.

63. The split-nut assembly of claim 59, wherein the nut comprises a first annular portion having a longitudinally graded diameter and a longitudinally adjacent second annular portion having a longitudinally graded diameter, wherein the larger diameter portion of the second annular portion abuts the smaller diameter portion of the first annular portion, and wherein the section retaining

means is a band that is engageable with the first and second annular portions of the nut.